Effectiveness Public Transport Monorail System on User Satisfaction in Kuala Lumpur, Malaysia

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Abstract- Urban planners and city authorities to days took great attention to public transportation and green transportation, due to the increasingly severe congestion, parking is limited, fuel saving, air pollution and environmental friendly. This research seeks to analyse the effectiveness of the service, the development of Kuala Lumpur monorail and user expectations, to provide input in the improvement of current performance and future. This study shows that the KL monorail public transport system has good potential and growing. From the observation of the average number of passengers in 2011 are 66,121 people each day. 3,673 passengers per hour and the percentage increase in the average number of passengers per year 12.48%. Importance Performance Analysis methods are important factors and service facilities are satisfactory and needs to be maintained performance, namely: Environmental and cleanliness in station, ticket counter, board information, punctuality of train arrival, cleanliness in the trains, security and installation of CCTV, reduce traffic congestion and environmental friendly. Several facilities are important but unsatisfactory service performance needs to be improved: Waiting area and escalator down, seats provided in the train, comfort when boarding train, additional coach and routes to other places, parking and public transport at the surrounding area.

Keywords – efektiveness; importance performance analysis; monorail.

I. INTRODUCTION

The issue of comfort on the road and traffic jams in urban areas is an issue global and this has caused a disruption and impact on the environment and psychology residents. Many large cities in the world, such as cities in Southeast Asia having the same problem. Bangkok in Thailand, Jakarta in Indonesia, Manila in the Philippines, Kuala Lumpur in Malaysia and some other part of city who suffer serious traffic congestion and never finished. Even so, the people seem to face a complicated situation and endured traffic jams every day to make ends meet in the city. Kuala Lumpur is the capital of Malaysia, which is the business center and tourist destination. The city covers an area of 243.65 km^2, and has a population of 1,674,621 as of 2010 with a population density of 6,891 people per km2 [1]. Progress of Kuala Lumpur one of them depends on the development and effectiveness of public transport services. Public transport services are part of the basic infrastructure and essential in the development of a country [2].

In an effort to reduce congestion, limited parking, air pollution, energy saving and developing the aesthetics of a modern city. As one solution is to build a monorail public transport system. This study aims to analyze the effectiveness of the service, the development of Kuala Lumpur monorail and user expectations, and to provide input in the improvement of current performance and future

II. LITERATURE REVIEW

The Monorail is a single rail serving as a track for passenger or freight vehicles. In most cases rail is elevated, but monorails can also run at grade, below grade or in subway tunnels. There are two basic monorail types: straddle and suspension monorail. The straddle monorail runs on track beams, which are mainly made of steel. Suspension monorail is suspended under track beams, which are made of steel. Monorail vehicle are wider than the guideway that supports them. The monorail system comprises guideway, car, station, power supply equipments, computer control systems and maintenance and storage facilities [3]. A detail monorail system structure diagram is shown in “Fig. 1”.

The advantages of monorail systems such as requiring minimal space, not much interfere with existing traffic flow, more cost effective and time saving in the construction of the foundation / rail compared with a conventional runway. Then it is also more secure than an accident, can reduce traffic congestion, friendly environments, lower carbon pollution (CO), and low noise pollution and add to the aesthetics of a modern city.

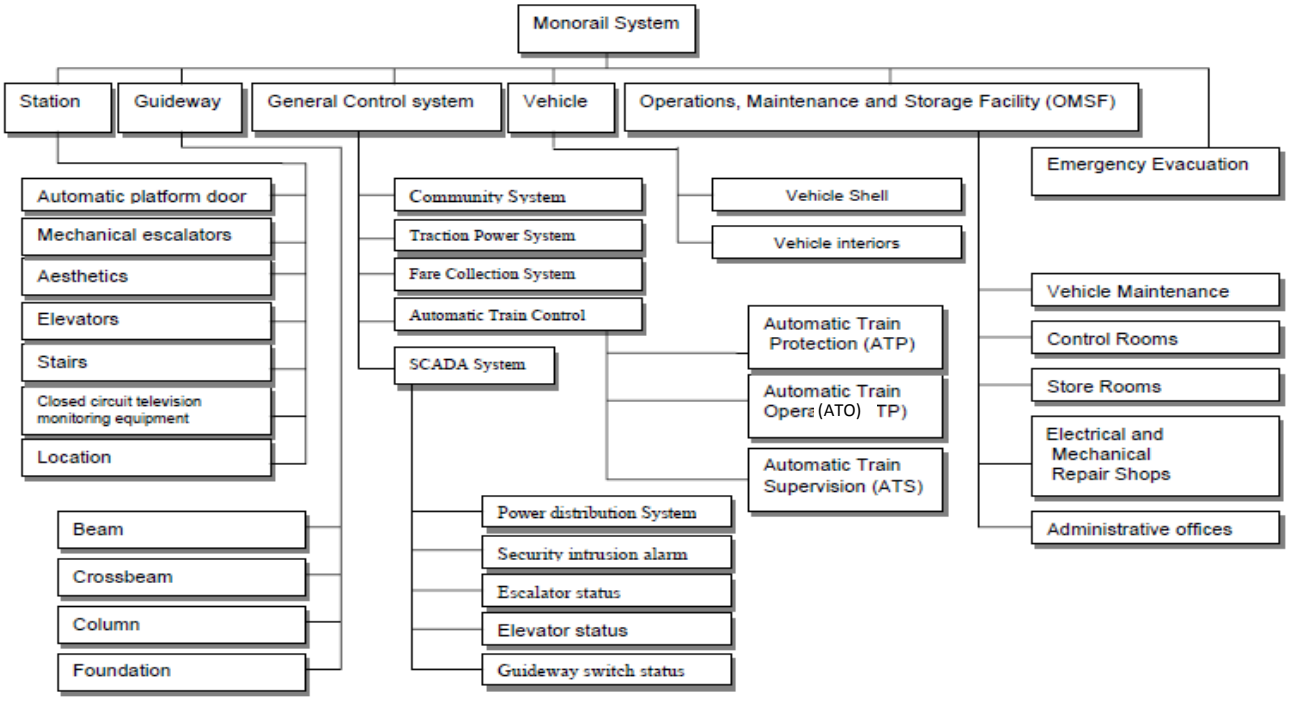

Figure 1. Structure of monorail system

The disadvantages of monorail systems such as monorail coachs are not the same as other rail types of infrastructure that should have a special foundation. When there is congestion passengers cannot be directly out of the coach, the safety team had to wait for the monorail located on high ground. Then next is cornering / turning at high speed rather difficult and the station must be united with the trajectory of not separate [4].

KL Monorail construction started in 1997 started with building facilities and runway Depot Building a monorail above ground (elevated) along the 8.6 km. Consisting of 11 (Eleven) station stops extending from the first station KL Sentral which is across the golden triangle and ends up Titi Wangsa is eleventh station "Fig. 3". Project transportation spends of RM 1,180 million and started operating on 31 August 2003 [5]. Table 1 shows the results of a survey of 2009 relating to the characteristics of users Kuala Lumpur Monorail.

TABLE 1: KUALA LUMPUR MONORAIL USER CHARACTERISTICS

Variable	Precentage
Nationality	Malaysian = 75.25 % , Others = 24.75 %
Gender	Male = 69.75%, Female = 30.25%
Age	(1 – 25) years = 56.5%, (26 – 60) years = 43.35 % , ≥ 60 years = 0.25%
Education	PhD/Master/Degree/Diploma = 41.5% , Others = 49.5%
Destinations	Work = 31%, Study = 11.75%, Shoping = 50.5%, Others = 6.75%
Occupation	Students = 45.25%, Official Government = 9.25%, Private = 45.5%
Monthly Income	≤ MYR 1,000 = 41.25%, MYR 1,000 – MYR5,000 = 47.25% ≥ MYR 5,000 = 4.25%, Others = 7.25%
Frequency	One time = 50.75%, more than = 49.25%

Sources: 2009 Survey results

III. METHODOLOGY

Many approaches to measuring satisfaction in the form of user behavior, including the method of Importance Performance Analysis (IPA), first introduced by Martilla and James (1977) in order to measure the relationship between consumer perceptions and priorities for improving the quality of products or services as well known as quadrant analysis [6] & [7].

Importance Performance Analysis has the main function to display information related to service factors, which influence consumer satisfaction and loyalty, and service factors, which consumers need to be increased due to the current conditions, are not satisfactory.

IPA combines the measurement of factors of importance and satisfaction levels in two-dimensional graphs that facilitate explanation of the data and get a practical proposal. [8] [9] IPA chart interpretation or translation is very easy, where the IPA chart as in mathematical logic is divided into four quadrants based on importance performance measurement results as shown in ."Fig. 2".

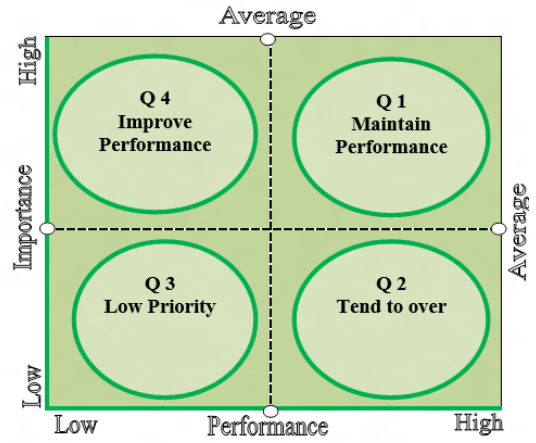

Figure 2: Quadrant map importance performance analysis

Explanatory caption for each quadrant [6]:

First quadrant, (high importance and high performance) maintain performance. The factors that lie in this quadrant are considered as factors contributing to customer satisfaction so that the management is obliged to ensure that the performance of its management institutions can continue to maintain the achievements that have been achieved.

Second quadrant, (low importance and high performance) tends to over. The factors that lie in this quadrant are considered not very important so that the management needs to allocate resources associated with these factors to other factors that have a higher priority handling that still need improvement, such as the fourth quadrant.

The third quadrant, (low importance and low performance) low priority. The factors that lie in this quadrant have a low level of satisfaction and well considered less important to consumers, so the management does not need to prioritize or less paying attention to these factors.

The fourth quadrant, (high importance and low performance) improve performance. The factors that lie in this quadrant are considered, as very important factors to consumers but current conditions are not satisfactory, so the management is obliged to allocate adequate resources to improve the performance of these various factors. The factors that lie in this quadrant is a priority for improvement.

The following procedures relating to the use of methods of IPA (Importance Performance Analysis):

- Determination of the factors to be analyzed;
- Conduct a survey through questionnaires;
- Calculate the average level of satisfaction and priority handling;
- Create a graph IPA (Importance Performance Analysis); and
- Conduct an evaluation of factors in accordance with their respective quadrants.

To determine the development of public transportation management system KL Monorail and measures the satisfaction of the users of the various factors relating to the operation of the KL Monorail in addition to observations and interviews with the management, who are competent in the field is also used quesioner with the question format in accordance with needs and methods of Importance Performance Analysis (IPA). Data collected through the deployment quesioner to the 400 respondents obtained based on the results of sampling using a random sampling Taro Yamane.

Implementation of the spread of the questionnaire on weekdays KL Monorail in Kuala Lumpur (Monday to Sunday) during peak hour shows the station and routes then location of the distribution of respondents "Fig. 3". Preliminary investigation conducted to evaluate the questionnaire and tested the validity and reliability to test whether each question valid and reliable. Testing was conducted using program Microsoft Excel and SPSS 13 in the following way:

a) Questions grouped in a single factor. The questions on the test that is have a scale (scale 1: very dissatisfied, scale 2: not satisfied, scale 3: moderate, scale 4: satisfaction, scale 5: very satisfied).
b) Data processed using the program Microsoft Excel and SPSS 13.
c) From the test results obtained by the validity and reliability of the test questions.

d) To test the validity can be seen from the corrected item-total correlation (t result) compared with (t table).

e) Basis for decision making to test the validity is *t result > t table*.

f) To test reliability can be seen from the value (rresult) contained on the analysis results are then compared with (r table).

g) Basis for decision making to test the reliability is *r result > r table*.

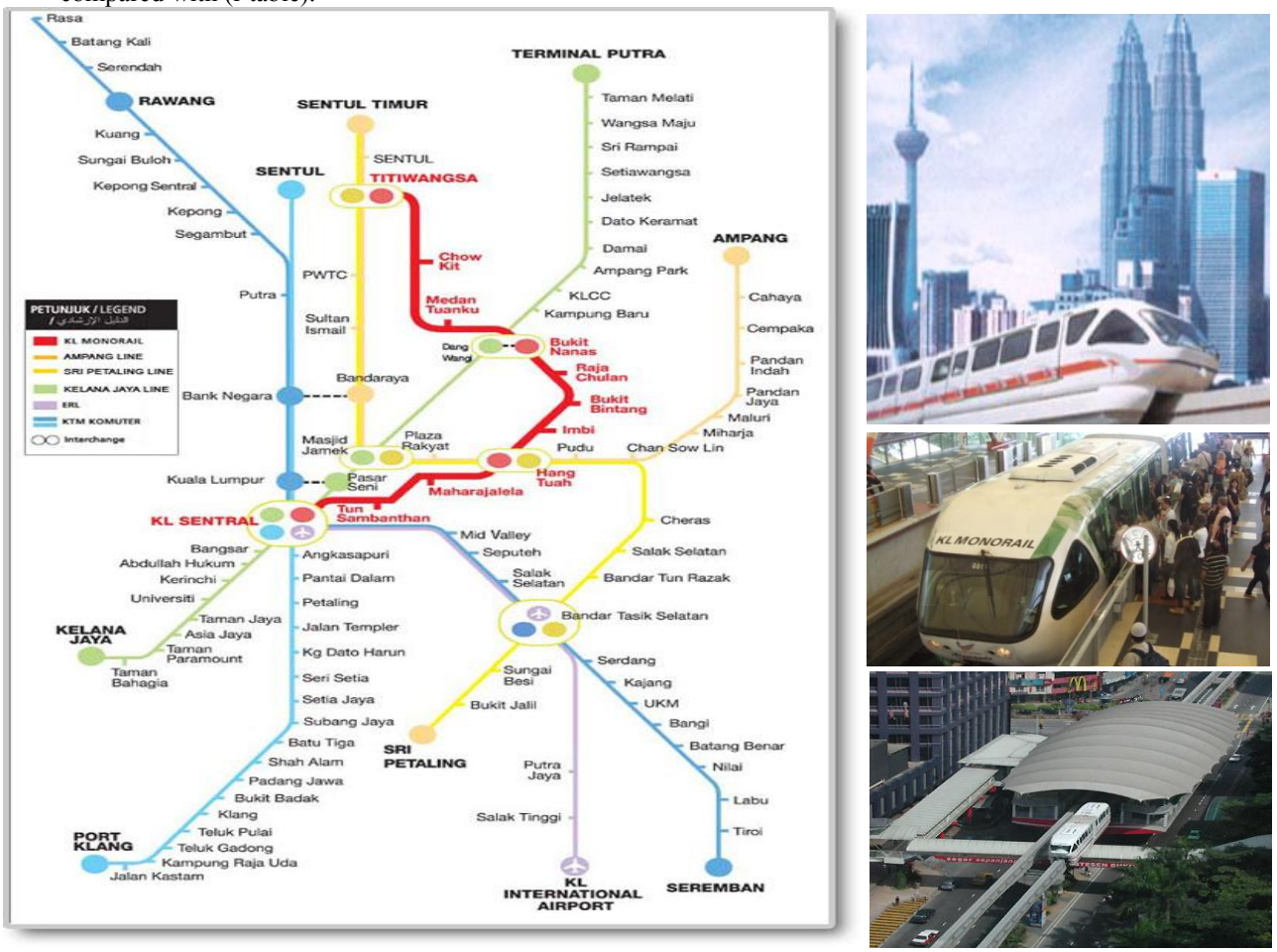

Figure 3: Maps of track station, coach KL Monorail and Integrated Transport System Klang Valley Malaysia
Sources: KLStarRail Sdn Bhd 2009

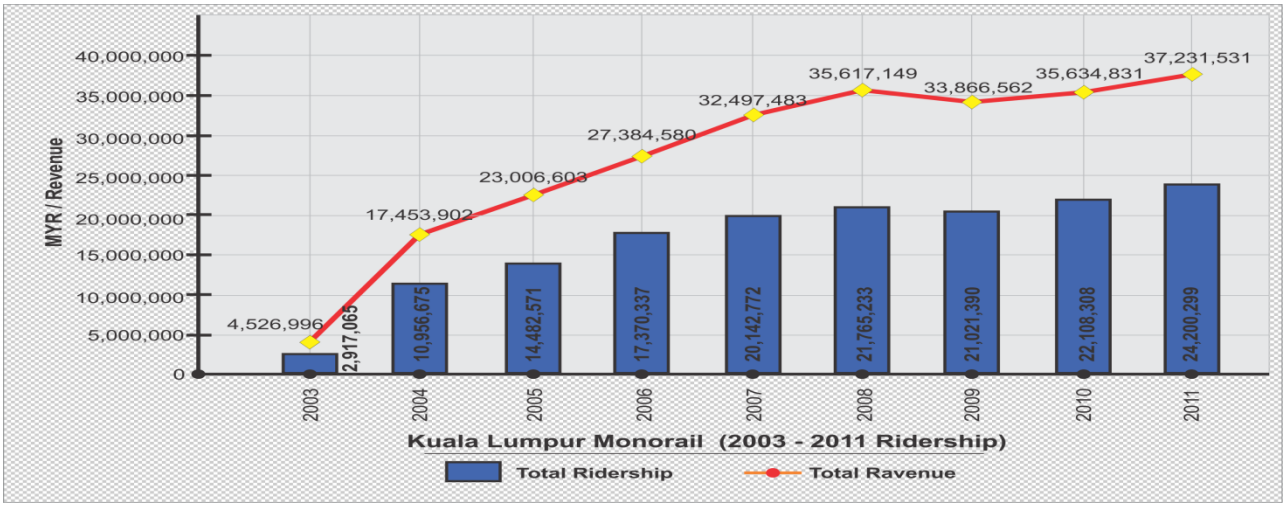

Figure 4: Graph comparison revenue and ridership KL monorail

IV. RESULTS AND ANALYSIS

A. Development of user quantity KL Monorail

From observations of KL Monorail in 2011 as shown in "Fig. 4", (2003-2011) average percentage increase in users 12.48% per year, the average user in 2011 was 66,121 passengers per day, every hour on average 3,673 passengers for 18 hours of operation from 06:00 am to 12:00 pm time Malaysia PM.

From table OD (Origin and Destination) Matrix Table 2 can be seen the flow of travel and the number of users every day KL monorail stations. Taken from the maximum daily number of passengers in August 2008 detected from 11 stations the highest OD value matrix is Bukit Bintang station and the low value of OD matrix is Tun Sambanthan station.

TABLE 2: AVERAGE USER OD MATRIX KL MONORAIL AUGUST 2008

O/D	KLS	TS	MAH	HT	IMB	BB	RC	BN	MT	CK	TIT	Total
KLS	32	42	206	794	3342	2731	994	241	201	670	739	9992
TS	29	4	27	97	130	150	109	31	13	28	25	643
MAH	197	36	10	191	318	356	152	116	39	87	51	1553
HT	664	125	173	45	968	1903	1398	297	101	208	42	5924
IMB	3422	166	318	968	86	421	414	699	318	862	833	8507
BB	2711	210	364	2204	447	83	370	1693	636	1651	1280	11649
RC	1035	134	148	1350	334	309	29	364	322	584	1014	5623
BN	241	32	107	309	679	1619	327	23	153	573	345	4408
MT	191	16	45	118	281	573	348	145	8	3969	131	5825
CK	691	29	83	216	796	1521	554	561	126	23	385	4985
TIT	610	24	42	52	759	1194	839	262	121	409	18	4330
Total	9823	818	1523	6344	8140	10860	5534	4432	2038	9064	4863	63439

O/D : Origin / Destination
KLS : KL Sentral station
TIT : Titiwangsa station
HT : Hang Tuah station
RC : Raja Chulan station
MT : Medan Tuanku station
TS : Tun Sambanthan station
IMB : Imbi station
BN : Bukit Nanas station
CK : Chow Kit station
MAH : Maharajalela station
BB : Bukit Bintang station

TABLE 3: AVERAGE SATISFACTION AND HANDLING PRIORITY FOR VARIOUS FACTORS

Case	Evidence	Average	
		Performance	Inportance
1	Environmental & cleanliness in station	14.75	18.56
2	Ticket counter	14.88	18.58
3	Reasonable ticket price	14.14	17.02
4	Waiting area & escalator down	13.83	18.53
5	Board information	14.19	18.46
6	Punctuality of train arrival	14.38	18.58
7	Seats provided in the train	13.12	18.62
8	Cleanliness in the train	15.54	18.69
9	Comfort when boarding train	13.22	18.67
10	Security, installation of CCTV	14.06	18.50
11	Additional coach and routes to other places	11.42	18.52
12	Parking & Public transport at the surrounding area	13.30	18.51
13	Reduce traffic congestion & environmental friendly	15.71	18.67
	Average	14.04	18.45

B. Results of Importance Performance Analysis (IPA)

Table 3 shows the results of the calculation of the average level of satisfaction and priority handling for each factor. From the results of 13 components can be illustrated graphically displayed in the form of IPA using the average value of the measurement results and the level of satisfaction a priority management purposes "Fig. 5" Based on the IPA chart in "Fig. 5" the factors related to the KL Monorail service may be grouped in each quadrant as follows:

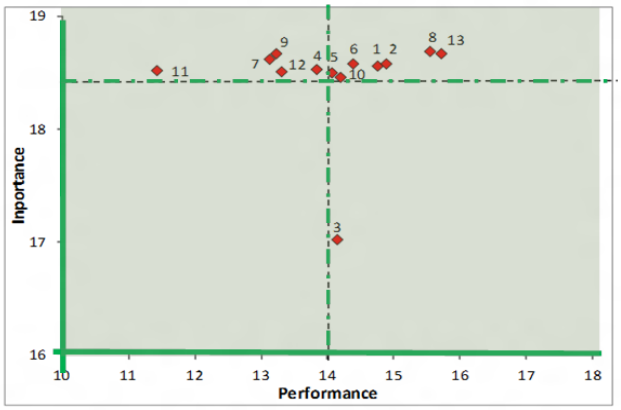

Figure5: Graph quadrant importance performance analysis based on the average value calculation results
Sources: Analysis result 2009

Quadrant 1: Environmental and cleanliness in stations, ticket counter, board information, punctuality of train arrival, cleanliness in the train, security installation of CCTV, reduce traffic congestion and environmental friendly. Factors located in this quadrant are considered as an additional factor for the user satisfaction KL monorail system and consistent with the results of related studies. KLStarRail as the manager is obliged to maintain the achievements that have been achieved.

Quadrant 2: Reasonable ticket price factor on offer from the analysis lies in this quadrant are considered satisfactory but not very important by the user so that the manager of KL Monorail does not need too much to allocate resources related to these factors, just enough to maintain and adapt to current conditions.

Quadrant 3: from the analysis in the third quadrant, no factor lies in this quadrant means a factor and low satisfaction levels are not important to the user KL monorail.

Quadrant 4: Waiting area and escalator down, seats provided in the train, comport when boarding train, additional coach and routes other places, parking and public transport at the surrounding area. The factors that lie in this quadrant are considered as very important factors, but current conditions are not satisfactory for users KL Monorail especially at morning and evening peak hours when going to and from work, so the manager should seek adequate resources to improve performance on a variety of factors. The factors that lie in this quadrant is a priority to be improved so users can continue to maintain interest.

V. CONCLUSIONS

KL Monorail transportation system is one of the public transport is very important and memorable for the community and tourists. This system is very helpful community in Kuala Lupur. Since years (2003-2011) the average percentage increase in passengers at 12.48% per year, by 2011 the total number of passengers 24,200,299 people with an average 66,121 passengers per day.

In general, users of public transportation system KL Monorail is quite satisfied with the condition and quality of service at this time. But if the manager wants to increase the attractiveness and the quantity of users or increase profits, it needs to be pursued some of the following; Improving service waiting area adds to the escalator down, improve the quality and quantity of seats in trains, additional coach and routes to others places, convenience of parking and public transportation to the surrounding areas, improving comfort when boarding trains must also conduct a campaign to highlight the advantages Monorail compared with other public transpotation.

This study is very importance because the public transportation that use monorail systems in the South East Asian Country (ASEAN), only in Kuala Lumpur Malaysia and Singapore. Should maintain and raise their services in order to make samples studies and pilot projects for development in the city or other countries. Particularly to address issues related to congestion, pollution and environmental friendly city toward green transportation.

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REFERENCES

[1] *Preliminarary Report 2010.* Department of Statistics Malaysia.

[2] Mageean, J., and Nelson, J. D. 2003. *The Evaluating of Demand Responsive Transport Service IB Europa.* Journal of Transport Geography, 11, 255-270.

[3] El-Diraby. 2003. *Constructability Analysis of Monorail Project*.

[4] Alan Ide. 2008. *The Monorail Alternatif.* A submision For the East West Link Needs Assessment Study.

[5] Kuala Lumpur Infrastructure Group Berhad. Prospectus 2003

[6] Brandt, D.R., 2000, "An "Outside-In" Approiach to Determining Customer-Driven Priorities for Improvement and Innovation", *White Paper Series*, Volume 2 – 2000.

[7] Latu, T.M., and Everett, A.M., 2000, *Review of Satisfaction Research and Measurement Approaches*, Department of Conservation,Wellington,New Zeland.

[8] Bacon, D. R. (2003). *A Comparison of Approaches to Importance-Performance Analysis.* International Journal of Marketing Research, 45 (1), 55-71.

[9] Ainin Sulaiman. 2008. Applying Importance-Performance Analisis to Information System: An Exploratory Case Study. *Journal of Information, Information Technology and Organizations* 3: 95-103.